

# Contents for Volume 31, 1999

James P. Syvitski	iii	Editor's Comment
John C. Behrendt	iv	Antarctic Science Then and Now
James B. Benedict	1-15	Effects of Changing Climate on Game-animal and Human Use of the Colorado High Country (U.S.A.) since 1000 BC
Eva Rawlings Parker and Robert L. Sanford, Jr.	16-20	The Effects of Mobile Tree Islands on Soil Phosphorus Concentrations and Distribution in an Alpine Tundra Ecosystem on Niwot Ridge, Colorado Front Range, U.S.A.
Martin C. Raillard and Josef Svoboda	21-26	Exact Growth and Increased Nitrogen Compensation by the Arctic Sedge <i>Carex aquatilis</i> var. <i>stans</i> after Simulated Grazing
Atsushi Kume, Takayuki Nakatsubo, Yukiko Bekku, and Takehiro Masuzawa	27-33	Ecological Significance of Different Growth Forms of Purple Saxifrage, <i>Saxifraga oppositifolia</i> L., in the High Arctic, Ny-Ålesund, Svalbard
Steven L. Forman	34-49	Infrared and Red Simulated Luminescence Dating of Late Quaternary Near-shore Sediments from Spitsbergen, Svalbard
James P. Syvitski, Anne E. Jennings, and John T. Andrews	50-57	High-resolution Seismic Evidence for Multiple Glaciation across the Southwest Iceland Shelf
Kazuhisa Chikita, Jageshwar Jha, and Tomomi Yamada	58-70	Hydrodynamics of a Supraglacial Lake and Its Effect on the Basin Expansion: Tsho Rolpa, Rolwaling Valley, Nepal Himalaya
C. S. M. Turney	71-81	Lacustrine Bulk Organic $\delta^{13}\text{C}$ in the British Isles during the Late Glacial-Holocene Transition (14-9 ka $^{14}\text{C}$ BP)
Reinhard Pienitz, John P. Smol, and Glen M. MacDonald	82-93	Paleolimnological Reconstruction of Holocene Climatic Trends from Two Boreal Treeline Lakes, Northwest Territories, Canada
Scott A. Elias, John T. Andrews, and Katherine H. Anderson	94-98	Insights on the Climatic Constraints on the Beetle Fauna of Coastal Alaska, U.S.A., Derived from the Mutual Climatic Range Method of Paleoclimate Reconstruction
Matthew R. Bennett, David Huddart, and Neil F. Glasser	99-107	Large-scale Bedrock Displacement by Cirque Glaciers
Frédéric Liébault, Pierre Clément, Hervé Piégay, and Norbert Landon	108-117	Assessment of Bedload Delivery from Tributaries: The Drôme River Case, France
Book Reviews	118-120	<i>Innocents on the Ice: A Memoir of Antarctic Exploration</i> . John C. Behrendt; <i>Mountains of the World: A Global Priority</i> . B. Messerli and J. D. Ives (eds.); <i>The Geology of Svalbard</i> . W. B. Harland; Books Received.
John F. Shroder, Jr., Rebecca A. Scheppy, and Michael P. Bishop	121-127	Denudation of Small Alpine Basins, Nanga Parbat Himalaya, Pakistan
F. Baumann and K. F. Kaiser	128-134	The Multetta Debris Fan, Eastern Swiss Alps: A 500-year Debris Flow Chronology
Florian Malard, Klement Tockner, and J. V. Ward	135-150	Shifting Dominance of Subcatchment Water Sources and Flow Paths in a Glacial Floodplain, Val Roseg, Switzerland

N. Pepin, D. Benham, and K. Taylor	151-164	Modeling Lapse Rates in the Maritime Uplands of Northern England: Implications for Climate Change
Masamu Aniya	165-173	Recent Glacier Variations of the Hielos Patagónicos, South America, and Their Contribution to Sea-level Change
Grant R. Bigg	174-178	An Estimate of the Flux of Iceberg Calving from Greenland
F. E. Nelson, N. I. Shiklomanov, and G. R. Mueller	179-186	Variability of Active-layer Thickness at Multiple Spatial Scales, North-central Alaska, U.S.A.
M. H. Jones, J. T. Fahnestock, and J. M. Welker	187-190	Early and Late Winter CO <sub>2</sub> Efflux from Arctic Tundra in the Kuparuk River Watershed, Alaska, U.S.A.
William D. Bowman, Amy Keller, and Mardy Nelson	191-195	Altitudinal Variation in Leaf Gas Exchange, Nitrogen and Phosphorus Concentrations, and Leaf Mass per Area in Populations of <i>Frasera speciosa</i>
Sylvi M. Sandvik, Ørjan Totland, and Jorun Nylén	196-201	Breeding System and Effects of Plant Size and Flowering Time on Reproductive Success in the Alpine Herb <i>Saxifraga stellaris</i> L.
Dana M. Bergstrom and P. M. Selkirk	202-208	Bryophyte Propagule Banks in a Feldmark on Subantarctic Macquarie Island
Book Reviews	209-210	<i>Searching for the Franklin Expedition: The Arctic Journal of Robert Randolph Carter</i> . Edited by Howard B. Gill, Jr. and Joanne Young. <i>The Ladies, the Gwich'in, and the Rat</i> . Clara C. Vyvyan (edited by I. S. MacLaren and Lisa N. LaFramboise)
Jack D. Ives and Bruno Messerli	211-213	AD 2002 Declared by United Nations as "International Year of the Mountains"
Jörg Bareiss, Hajo Eicken, Alfred Helbig, and Thomas Martin	214-229	Impact of River Discharge and Regional Climatology on the Decay of Sea Ice in the Laptev Sea during Spring and Early Summer
Andrew D. Kennedy	230-241	Modeling the Determinants of Species Distributions in Antarctica
Wolfgang Gindl	242-246	Climatic Significance of Light Rings in Timberline Spruce, <i>Picea abies</i> , Austrian Alps
Ruben Sommaruga, Roland Psenner, Ellen Schaffner, Karin A. Koinig, and Sabine Sommaruga-Wögrath	247-253	Dissolved Organic Carbon Concentration and Phytoplankton Biomass in High-mountain Lakes of the Austrian Alps: Potential Effect of Climatic Warming on UV Underwater Attenuation
Milan C. Vavrek, Ned Fetcher, James B. McGraw, G. R. Shaver, F. Stuart Chapin III, and Brian Bovard	254-258	Recovery of Productivity and Species Diversity in Tussock Tundra following Disturbance
Jorun Nylén and Ørjan Totland	259-263	Effects of Temperature and Natural Disturbance on Growth, Reproduction, and Population Density in the Alpine Annual Hemiparasite <i>Euphrasia frigida</i>
Lotte Illeris and Sven Jonasson	264-271	Soil and Plant CO <sub>2</sub> Emission in Response to Variations in Soil Moisture and Temperature and to Amendment with Nitrogen, Phosphorus, and Carbon in Northern Scandinavia
J. M. Welker, K. B. Brown, and J. T. Fahnestock	272-277	CO <sub>2</sub> Flux in Arctic and Alpine Dry Tundra: Comparative Field Responses Under Ambient and Experimentally Warmed Conditions

Marion Klaus, Robert E. Moore, and Ernest Vyse	278-282	Impact of Precipitation and Grazing on the Water Vole in the Beartooth Mountains of Montana and Wyoming, U.S.A.
Jonathan H. Titus and Shiro Tsuyuzaki	283-292	Ski Slope Vegetation of Mount Hood, Oregon, U.S.A.
Craig B. Clements	293-302	Mountain and Valley Winds of Lee Vining Canyon, Si- erra Nevada, California, U.S.A.
James P. Doerner and Paul E. Carrara	303-311	Deglaciation and Postglacial Vegetation History of the West Mountains, West-central Idaho, U.S.A.
Chris Keylock and Ulrik Domaas	312-320	Evaluation of Topographic Models of Rockfall Travel Distance for Use in Hazard Applications
Niels Tvis Knudsen and Bent Hasholt	321-328	Radio-echo Sounding at the Mittivakkat Gletscher, South- east Greenland
Book Reviews	329-332	<i>Paleoclimatology: Reconstructing Climates of the Qua- ternary.</i> By Raymond S. Bradley; <i>Imaging the Arctic.</i> Edited by J. C. H. King and Henrietta Lidchi; <i>The Set- tlement of Iceland: A Critical Approach.</i> <i>Granastaðir and the Ecological Heritage.</i> By Bjarni F. Einarsson; <i>Ocean, Ice, and Atmosphere: Interactions at the Antarctic Con- tinental Margin.</i> Edited by Stanley S. Jacobs and Ray F. Weiss
Addendum	332	
Kenichi Matsuoka and Renji Naruse	333-340	Mass Balance Features Derived from a Firn Core at Hielo Patagónico Norte, South America
David M. Livingstone, André F. Lotter, and Ian R. Walker	341-352	The Decrease in Summer Surface Water Temperature with Altitude in Swiss Alpine Lakes: A Comparison with Air Temperature Lapse Rates
Irene Gregory-Eaves, John P. Smol, Bruce P. Finney, and Mary E. Edwards	353-365	Diatom-based Transfer Functions for Inferring Past Cli- matic and Environmental Changes in Alaska, U.S.A.
R. Scott Anderson, Jim Hasbargen, Peter A. Koehler, and Eric J. Feiler	366-378	Late Wisconsin and Holocene Subalpine Forests of the Markagunt Plateau of Utah, Southwestern Colorado Pla- teau, U.S.A.
W. H. Moir, Shannon G. Rochelle, and A. W. Schoettle	379-388	Microscale Patterns of Tree Establishment near Upper Treeline, Snowy Range, Wyoming, U.S.A.
Bruce C. Forbes and Olga I. Sumina	389-399	Comparative Ordination of Low Arctic Vegetation Re- covering from Disturbance: Reconciling Two Contrasting Approaches for Field Data Collection
Kerstin Huss-Danell, Halldor Sverrisson, Ann-Sofi Hahlin, and Kjell Danell	400-406	Occurrence of <i>Alnus</i> -infective <i>Frankia</i> and <i>Trifolium</i> -in- fective <i>Rhizobium</i> in Circumpolar Soils
Daniel Gómez-García, S. M. Giannoni, Ramón Reiné, and Carlos E. Borghi	407-411	Movement of Seeds by the Burrowing Activity of Mole- Voles on Disturbed Soil Mounds in the Spanish Pyrenees
J. M. Selkirk and L. J. Saffigna	412-420	Wind and Water Erosion of a Peat and Sand Area on Subantarctic Macquarie Island
John A. Matthews, Richard A. Shakesby, Lindsey J. McEwen, Mark S. Berrisford, Geraint Owen, and Philip Bevan	421-435	Alpine Debris-flows in Leirdalen, Jotunheimen, Norway, with Particular Reference to Distal Fans, Intermediate- type Deposits, and Flow Types
Kevin Hall, Jan Boelhouwers, and Kevin Driscoll	436-446	Animals as Erosion Agents in the Alpine Zone: Some Data and Observations from Canada, Lesotho, and Tibet

*The Vegetation Types of Northeast Greenland: A Phytosociological Study Based Mainly on Material Left by Th. Sørensen from the 1931-1935 Expeditions.* By Bent Fredskild. *Under Polaris: An Arctic Quest.* By Tahoe Talbot Washburn. *Protecting the Arctic: Indigenous Peoples and Cultural Survival.* By Mark Nuttall. *Voyage of the Belgica: Fifteen Months in the Antarctic.* By Adrien de Gerlache; Books Received.

## Subject and Author Index for Vol. 31, 1999

- Actinorhiza, 400-406  
 Active layer, 179-186  
 Air temperature, 341-352  
 Alaska: Beetle fauna, 94-98  
 Alaska: Climate and environmental change, 353-365; CO<sub>2</sub> flux, 187-190; North Slope, 179-186; Permafrost, 179-186; Productivity and species diversity, 254-258  
*Alnus*, 400-406  
 Alpine: Basin denudation, 121-127; Debris flows, 421-435; Erosion, 436-446; Plant reproduction, 196-210  
 Alpine tundra, 16-20, 272-277, 379-388; Human population density, 1-15; Soil phosphorus, 16-20  
 Alps: Floodplain, 135-150; Debris fan, 128-134; Dendrochronology, 242-246; Lakes, 247-253, 341-352  
 Altitudinal variation in leaf gas exchange, 191-195  
 Anderson, K. H. *See* Elias, S. A., et al.  
 Anderson, R. S., Hasbargen, J., Koehler, P. A., and Feiler, E. J. (Late Wisconsin and Holocene Subalpine Forests of the Markagunt Plateau of Utah, Southwestern Colorado Plateau, U.S.A.), 366-378  
 Andrews, J. T. *See* Elias, S. A., et al. and Syvitski, J. P., et al.  
 Animals as erosion agents, 436-446  
 Aniya M. (Recent Glacier Variations of the Hielos Patagónicos, South America, and Their Contribution to Sea-level Change), 165-173  
 Antarctic science, iv  
 Antarctic: Species distribution and survival, 230-241  
 Archaeology, 1-15  
 Arctic: Beetle fauna, 94-98; Grazing, 21-26; Growth forms, 27-33; Hydrology, 214-229; Permafrost, 179-186; Soils, 400-406; Tundra, 179-186, 187-190, 272-277, 254-258; Vegetation, 389-399  
 Bareiss, J., Eicken, H., Helbig, A., and Martin, T. (Impact of River Discharge and Regional Climatology on the Decay of Sea Ice in the Laptev Sea during Spring and Early Summer), 214-229  
 Baumann, F. and Kaiser, K. F. (The Muttetta Debris Fan, Eastern Swiss Alps: A 500-year Debris Flow Chronology), 128-134  
 Bedload transport, 108-117  
 Bedrock displacement, 99-107  
 Beetle fauna, 94-98  
 Bekku, Y. *See* Kume, A., et al.  
 Benedict, J. B. (Effects of Changing Climate on Game-animal and Human Use of the Colorado High Country [U.S.A.] since 1000 BC), 1-15  
 Benham, D. *See* Pepin, N., et al.  
 Bennett, M. R., Huddart, D., and Glasser, N. F. (Large-scale Bedrock Displacement by Cirque Glaciers), 99-107  
 Bergstrom, D. M. and Selkirk, P. M. (Bryophyte Propagule Banks in a Feldmark on Subantarctic Macquarie Island), 202-208  
 Berrisford, M. S. *See* Matthews, J. A., et al.  
 Bevan, P. *See* Matthews, J. A., et al.  
 Bigg, G. R. (An Estimate of the Flux of Iceberg Calving from Greenland), 174-178  
 Bishop, M. P. *See* Shroder, J. F., Jr., et al.  
 Boelhouwers, J. *See* Hall, K., et al.  
 Book Reviews  
*The Geology of Svalbard.* W. B. Harland, 119-120  
*Innocents on the Ice: A Memoir of Antarctic Exploration.* J. C. Behrendt, 118  
*Imaging the Arctic.* Ed. J. C. H. King and Henrietta Lidchi, 329-330  
*The Ladies, The Gwich'in, and the Rat.* Clara C. Vyvyan (ed. I. S. MacLaren and Lisa N. LaFramboise), 209-210  
*Mountains of the World: A Global Priority.* B. Messerli and J. D. Ives, 119  
*Ocean, Ice, and Atmosphere: Interactions at the Antarctic Continental Margins.* Edited by Stanley S. Jacobs and Ray F. Weiss, 331-332  
*Paleoclimatology: Reconstructing Climates of the Quaternary.* Raymond S. Bradley  
*Protecting the Arctic: Indigenous Peoples and Cultural Survival.* Mark Nuttall, 448  
*Searching for the Franklin Expedition: The Arctic Journal of Robert Randolph Carter.* Ed. H. B. Gill, 209  
*The Settlement of Iceland: A Critical Approach.* Granastadir and the Ecological Heritage. Bjarni F. Einarsson, 330-331  
*The Vegetation Types of Northeast Greenland. A Phytosociological Study Based Mainly on Material Left by Th. Sørensen from the 1931-1935 Expeditions.* Bent Fredskild, 447  
*Under Polaris: An Arctic Quest.* Tahoe Washburn, 447-448  
*Voyage of the Belgica: Fifteen Months in the Antarctic.* Adrien de Gerlache, 448-449  
 Borghi, C. E. *See* Gómez-García, D., et al.  
 Bovard, B. *See* Vavrek, M. C., et al.  
 Bowman, W. D., Keller, A., and Nelson, M. (Altitudinal Variation in Leaf Gas Exchange, Nitrogen and Phosphorus Concentrations, and Leaf Mass per Area in Populations of *Frasera speciosa*), 191-195  
 Breeding system, 196-201  
 Brown, K. B. *See* Welker, J. M., et al.  
 Bryophyte, 202-208  
 Canada: Erosion, 436-446  
 Carbon: Amendment, 264-271; DOC, 82-93, 247-253; Organic  $\delta^{13}\text{C}$ , 71-81  
 Carbon dioxide: Emission, 264-271; Flux, 187-190, 272-277  
*Carex aquatilis*, 21-26



- Carrara, P. E. *See* Doerner, J. P. and Carrara, P. E.  
 Chapin, F. S., III. *See* Vavrek, M. C., et al.  
 Chikita, K., Jha, J., and Yamada, T. (Hydrodynamics of a Supraglacial Lake and Its Effect on the Basin Expansion: Tsho Rolpa, Rolwaling Valley, Nepal Himalaya), 58–70  
 Cirque glaciers, 99–107  
 Clément, P. *See* Liébault, F., et al.  
 Clements, C. B. (Mountain and Valley Winds of Lee Vining Canyon, Sierra Nevada, California, U.S.A.), 293–302  
 Climate change, 1–15, 151–164, 202–208, 247–253, 259–263, 264–271, 272–277, 303–311, 341–352, 353–365, 366–378, 379–388  
 Climate history, 242–246  
 Clipping, 21–26  
 Colorado: Alpine tundra, 1–15, 16–20; Human use of High Country, 1–15; Shortgrass plains, 1–15  
 Colorado Plateau, 366–378  
 Core drilling, 333–340
- Danell, K. *See* Huss-Danell, K., et al.  
 Debris fan, 121–127, 128–134  
 Debris flow, 421–435  
 Deglaciation history, 303–311  
 Deglaciation: Svalbard, 34–39, 128–134, 242–246  
 Denudation, 121–127  
 Diatoms, 82–93, 353–365  
 Dissolved organic carbon, 82–93, 247–253  
 Disturbance, 254–258, 259–263, 283–292, 389–399, 407–411  
 Doerner, J. P. and Carrara, P. E. (Deglaciation and Postglacial Vegetation History of the West Mountains, West-central Idaho, U.S.A.), 303–311  
 Domaas, U. *See* Keylock, C. and Domaas, U.  
 Driscoll, K. *See* Hall, K., et al.
- Ecology: Disturbance, 254–258; Grazing, 21–26; Growth forms, 27–33; Water vole, 278–282  
 Editorial, iii  
 Edwards, M. E. *See* Gregory-Eaves, I., et al.  
 Eicken, H. *See* Bareiss, J., et al.  
 Elias, S. A., Andrews, J. T., and Anderson, K. H. (Insights into the Climatic Constraints on the Beetle Fauna of Coastal Alaska, U.S.A., Derived from the Mutual Climatic Range Method of Paleoclimatic Reconstruction), 94–98  
 England: Maritime uplands, 151–164  
 Erosion: Glacial, 99–107; Himalayas, 121–127; Peat, 412–420; Stream, 108–117  
*Euphrasia frigida*, 259–263
- Fahnestock, J. T. *See* Jones, M. H. et al. and Welker, J. M., et al.  
 Feiler, E. J. *See* Anderson, R. S., et al.  
 Feldmark, 202–208  
 Fetcher, N. *See* Vavrek, M. C., et al.  
 Field data collection, 389–399  
 Finney, B. P. *See* Gregory-Eaves, I., et al.  
 Firn, 333–340  
 Flooding, 214–229  
 Floodplain, 125–150  
 Flow paths, 135–150  
 Forbes, B. C. and Sumina, O. I. (Comparative Ordination of Low Arctic Vegetation Recovering from Disturbance: Reconciling Two Contrasting Approaches for Field Data Collection), 389–399  
 Forman, S. L. (Infrared and Red Simulated Luminescence Dating of Late Quaternary Near-shore Sediments from Spitsbergen, Svalbard), 34–39  
 France: Prealps, 108–117  
*Frankia*, 400–406  
*Frasera speciosa*, 191–195
- Geochronology, 34–39  
 Geomorphology: Debris fan, 121–127, 128–134; Debris flow, 421–435; Denudation, 121–127; Erosion, 108–117, 412–420, 436–446  
 Geophysical evidence, 50–57  
 Giannoni, S. M. *See* Gómez-García, D., et al.  
 Gindl, W. (Climatic Significance of Light Rings in Timberline Spruce, *Picea abies*, Austrian Alps), 242–246  
 Glacial erosion rates, 99–107  
 Glacial floodplain, 135–150  
 Glacial marine sediments, 50–57  
 Glaciation, Iceland Shelf, 50–57  
 Glacier lake, 58–70  
 Glacier topography, 321–328  
 Glacier variation, 165–173  
 Glaciology: Mass balance, 174–178, 333–340  
 Glasser, N. F. *See* Bennett, M. R., et al.  
 Gómez-García, D., Giannoni, S. M., Reiné, R., and Borghi, C. E. (Movement of Seeds by Burrowing Activity of Mole-Voles on Disturbed Soil Mounds in the Spanish Pyrenees), 407–411  
 Grazing, 21–26; Impact on water vole, 278–282  
 Greenland: Glaciers, 321–328; Icebergs, 174–178  
 Gregory-Eaves, I., Smol, J. P., Finney, B. P., and Edwards, M. E. (Diatom-based Transfer Functions for Inferring Past Climatic and Environmental Changes in Alaska, U.S.A.), 353–365  
 Growth forms, 27–33  
 Growth of *Carex*, 21–26
- Hahlin, A.-S. *See* Huss-Danell, K., et al.  
 Hall, K., Boelhouwers, J., and Driscoll, K. (Animals as Erosion Agents in the Alpine Zone: Some Data and Observations from Canada, Lesotho, and Tibet), 436–446  
 Hasbargen, J. *See* Anderson, R. S., et al.  
 Hasholt, B. *See* Knudsen, N. T. and Hasholt, B.  
 Hazard applications, 312–320  
 Heilo Patagónicos, 165–173, 333–340  
 Helbig, A. *See* Bareiss, J., et al.  
 Himalaya: Denudation, 121–127  
 Holocene climate, 82–93, 366–378  
 Huddart, D. *See* Bennett, M. R., et al.  
 Human population density, 1–15  
 Huss-Danell, K., Sverrisson, H., Hahlin, A.-S., and Danell, K. (Occurrence of *Alnus*-infective *Frankia* and *Trifolium*-infective *Rhizobium* in Circumpolar Soils), 400–406  
 Hydrochemical tracer, 135–150  
 Hydrodynamics, 58–70  
 Hydrologic cycle, 214–229  
 Hydrology: Bedload transport, 108–117; Glacial floodplain, 135–150; River discharge, 214–229
- Iceberg calving, 174–178  
 Iceland Shelf, 50–57  
 Illeris, L. and Jonasson, S. (Soil and Plant CO<sub>2</sub> Emission in Response to Variations in Soil Moisture and Temperature and to Amendment with Nitrogen, Phosphorus, and Carbon in Northern Scandinavia), 264–271  
 International Tundra Experiment, 27–33, 389–399  
 International Year of the Mountains, 211–213  
 Ives, J. D. and Messerli, B. (AD 2002 Declared by United Nations as "International Year of the Mountains"), 211–213
- Jennings, A. E. *See* Syvitski, J. P., et al.  
 Jha, J. *See* Chikita, K., et al.  
 John C. Behrendt (Antarctic Science Then and Now), iv  
 Jonasson, S. *See* Illeris, L. and Jonasson, S.  
 Jones, M. H., Fahnestock, J. T., and Welker, J. M. (Early and Late Winter CO<sub>2</sub> Efflux from Arctic Tundra in the Kuparuk River Watershed, Alaska, U.S.A.), 187–190

- Kaiser, K. F. *See* Baumann, F. and Kaiser, K. F.  
 Keller, A. *See* Bowman, W. D., et al.  
 Kennedy, A. D. (Modeling the Determinants of Species Distributions in Antarctica), 230–241  
 Keylock, C. and Domaas, U. (Evaluation of Topographic Models of Rockfall Travel Distance for Use in Hazard Applications), 312–320  
 Klaus, M., Moore, R. E., and Vyse, E. (Impact of Precipitation and Grazing on the Water Vole in the Beartooth Mountains of Montana and Wyoming, U.S.A.), 278–282  
 Knudsen, N. T. and Hasholt, B. (Radio-echo Sounding at the Mittivakkat Gletscher, Southeast Greenland), 321–328  
 Koehler, P. A. *See* Anderson, R. S., et al.  
 Koinig, K. A. *See* Sommaruga, R., et al.  
 Krumholz, 16–20  
 Kume, A., Nakatsubo, T., Bekku, Y., and Masuzawa, T. (Ecological Significance of Different Growth Forms of Purple Saxifrage, *Saxifraga oppositifolia* L., in the High Arctic, Ny-Ålesund, Svalbard), 27–33  
 Kupařuk River basin, 179–186, 187–190
- Lacustrine carbon, 71–81  
 Lake hydrodynamics, 58–70  
 Lake water, 353–365; temperature, 341–352  
 Lakes: Alpine 247–253, 341–352; Boreal, 82–93; Himalayas, 58–70  
 Land-ocean interaction, 214–229  
 Landon, N. *See* Liébault, F., et al.  
 Landslide, 421–432  
 Lapse rate, 151–164, 341–352  
 Laptev Sea, 214–229  
 Last Glacial-Holocene transition, 71–81  
 Late Wisconsin climate, 366–378  
 Leaf gas exchange, 191–195  
 Lena River, 214–229  
 Lesotho: Erosion, 436–446  
 Lichen snowkill, 1–15  
 Liébault, F., Clément, P., Piégay, H., and Landon, N. (Assessment of Bedload Delivery from Tributaries: The Drôme River Case, France), 108–117  
 Light rings, 242–246  
 Limnology, 247–253  
 Little Ice Age, 1–15  
 Livingstone, D. M., Lotter, A. F., and Walker, I. R. (The Decrease in Summer Surface Water Temperature with Altitude in Swiss Alpine Lakes: A Comparison with Air Temperature Lapse Rates), 341–352  
 Lotter, A. F. *See* Livingstone, D. M., et al.  
 Luminescence dating, 34–39
- MacDonald, G. *See* Pienitz, R., et al.  
 Macquarie Island, 202–208, 412–420  
 Malard, F., Tockner, K., and Ward, J. V. (Shifting Dominance of Subcatchment Water Sources and Flow Paths in a Glacial Floodplain, Val Roseg, Switzerland), 135–150  
 Martin, T. *See* Bareiss, J., et al.  
 Mass balance, 174–178, 333–340  
 Mass movement, 128–134, 421–432  
 Masuzawa, T. *See* Kume, A., et al.  
 Matsuoka, K. and Naruse, R. (Mass Balance Features Derived from a Firn Core at Hielo Patagónica Norte, South America), 333–340  
 Matthews, J. A., Shakesby, R. A., McEwen, L. J., Berrisford, M. S., Owen, G. and Bevan, P. (Alpine Debris-flows in Leiridalen, Jotunheimen, Norway, with Particular Reference to Distal Fans, Intermediate-type Deposits, and Flow Types), 421–435  
 McEwen, L. J. *See* Matthews, J. A., et al.  
 McGraw, J. B. *See* Vavrek, M. C., et al.  
 Medieval Warm Period, 1–15
- Messerli, B. *See* Ives, J. D. and Messerli, B.  
 Meteorological data, 151–164  
 Meteorology, 293–302  
*Microtus richardsonii*, 278–282  
 Mittivakkat Gletscher, 321–328  
 Moir, W. H., Rochelle, S. G., and Schoettle, A. W. (Microscale Patterns of Tree Establishment near Upper Timberline, Snowy Range, Wyoming, U.S.A.), 379–388  
 Mole-voles, 407–411  
 Moore, R. E. *See* Klaus, M., et al.  
 Moraines, 99–107  
 Mountain winds, 293–302  
 Mueller, G. R. *See* Nelson, F. E., et al.  
 Muskox, 21–26  
 Mutual Climatic Range Method, 94–98
- Nakatsubo, T. *See* Kume, A., et al.  
 Nanga Parbat Himalaya, 121–127  
 Naruse, R. *See* Matsuoka, K. and Naruse, R.  
 Nelson, F. E., Shiklomanov, N. I., and Mueller, G. R. (Variability of Active-layer Thickness at Multiple Spatial Scales, North-central Alaska, U.S.A.), 179–186  
 Nelson, M. *See* Bowman, W. D., et al.  
 Nepal Himalaya, 58–70  
 Nitrogen: Amendment, 264–271; Compensation, 21–26; Concentration, 191–195  
 Nodulation, 400–406  
 Norway: Alpine plant reproduction, 196–201; Debris flows, 421–435; Growth of *Euphrasia*, 259–263  
 Nylén, J. and Totland, Ø. (Effects of Temperature and Natural Disturbance on Growth, Reproduction, and Population Density in the Alpine Annual Hemiparasite *Euphrasia frigida*), 259–263  
 Nylén, J. *See also* Sandvik, S. M., et al.
- Ordination, 379–388, 389–399  
 Organic  $\delta^{13}\text{C}$ , 71–81  
 Owen, G. *See* Matthews, J. A., et al.
- Paleoclimatology, 341–352  
 Paleoclimatology, 71–81, 82–93, 94–98, 353–365  
 Paleocology, 366–378  
 Paleoenvironmental change, 1–15  
 Paleolimnology, 82–93, 341–352, 353–365  
 Parker, E. R. and Sanford, R. L. Jr. (The Effects of Mobile Tree Islands on Soil Phosphorus Concentrations and Distribution in an Alpine Tundra Ecosystem on Niwot Ridge, Colorado Front Range, U.S.A.), 16–20  
 Patagonia Icefields, 165–173, 333–340  
 Peat erosion, 412–420  
 Pepin, N., Benham, D., and Taylor, K. (Modeling Lapse Rates in the Maritime Uplands of Northern England: Implications for Climate Change), 151–164  
 Periglacial processes, 436–446  
 Permafrost, 179–186  
 Phosphorus: Amendment, 264–271; Concentration, 191–195  
 Phytoplankton, 247–253  
*Picea abies*, 242–246  
 Piégay, H. *See* Liébault, F., et al.  
 Pienitz, R., Smol, J. P., and MacDonald, G. (Paleolimnological Reconstructions of Holocene Climatic Trends from Two Boreal Treeline Lakes, Northwest Territories, Canada), 82–93  
 Pinedale deglaciation, 303–311  
 Plant: Communities, 283–292, 379–388; Competition, 379–388; Macrofossils, 366–378  
 Pollen analysis, 303–311, 366–378  
 Polymorphism, 27–33  
 Postglacial vegetation history, 303–311  
 Precipitation: Impact on water vole, 278–282  
 Productivity, 254–258

- Propagule banks, 202–208  
 Proxy calibration, 341–352  
 Psenner, R. *See* Sommaruga, R., et al.
- Quaternary sediments, 34–39
- Radio-echo sounding, 321–328  
 Radiocarbon dating, 1–15, 71–81  
 Raillard, M. C. and Svoboda, J. (Exact Growth and Increased Nitrogen Compensation by the Arctic Sedge *Carex aquatilis* var. *stans* after Simulated Grazing), 21–26  
 Reiné, R. *See* Gómez-García, D., et al.  
 Reproductive success, 196–201  
 River discharge, 214–229  
 Rochelle, S. G. *See* Moir, W. H., et al.  
 Rockfall travel distance, 312–320  
 Russia: Arctic vegetation, 389–399
- Saffigna, L. J. *See* Selkirk, J. M. and Saffigna, L. J.  
 Sandvik, S. M., Totland, Ø., and Nylén, J. (Breeding System and Effects of Plant Size and Flowering Time on Reproductive Success in the Alpine Herb *Saxifraga stellaris* L.), 196–201  
 Sanford, R. L., Jr. *See* Parker, E. P. and Sanford, R. L., Jr.  
*Saxifraga oppositifolia*, 27–33  
*Saxifraga stellaris*, 196–201  
 Schafferer, E. *See* Sommaruga, R., et al.  
 Scheppy, R. A. *See* Shroder, J. F., Jr., et al.  
 Schoettle, A. W. *See* Moir, W. H., et al.  
 Sea-ice decay, 214–229  
 Sea-level change, 165–173  
 Sedimentology, 421–432  
 Seeds, 407–411  
 Seismic evidence, 50–57  
 Selkirk, J. M. and Saffigna, L. J. (Wind and Water Erosion of a Peat and Sand Area on Subantarctic Macquarie Island), 412–420  
 Selkirk, P. M. *See* Bergstrom, D. M. and Selkirk, P. M.  
 Shakesby, R. A. *See* Matthews, J. A., et al.  
 Shaver, G. R. *See* Vavrek, M. C., et al.  
 Shiklomanov, N. I. *See* Nelson, F. E., et al.  
 Shroder, J. F., Jr., Scheppy, R. A., and Bishop, M. P. (Denudation of Small Alpine Basins, Nanga Parbat Himalaya, Pakistan), 121–127  
 Sierra Nevada, California, 293–302  
 Ski slope vegetation, 283–292  
 Smol, J. P. *See* Gregory-Eaves, I., et al. and Pienitz, R., et al.  
 Snow: Colorado High Country, 1–15  
 Snowbed plant, 196–201  
 Soil: Circumpolar, 400–406; Phosphorus, 16–20  
 Sommaruga, R., Psenner, R., Schafferer, E., Koinig, K. A., and Sommaruga-Wögrath, S. (Dissolved Organic Carbon Concentration and Phytoplankton Biomass in High-mountain Lakes of the Austrian Alps: Potential Effects of Climatic Warming), 247–253  
 Sommaruga-Wögrath, S. *See* Sommaruga, R., et al.  
 Spanish Pyrenees, 407–411  
 Species: Distribution, 230–241; Diversity, 254–258; Survival, 230–241  
 Stable isotopes, 71–81  
 Stream erosion, 108–117  
 Subalpine forests, 366–378, 379–388  
 Subantarctic: Bryophyte, 202–208; Erosion, 412–420  
 Subarctic: CO<sub>2</sub> emission, 264–271  
 Subterranean mammals, 407–411  
 Sumina, O. I. *See* Forbes, B. C. and Sumina, O. I.
- Supraglacial lake, 58–70  
 Svalbard: Cirque glaciers, 99–107; Ecology, 27–33; Geochronology, 34–39  
 Sverrisson, H. *See* Huss-Danell, K., et al.  
 Svoboda, J. *See* Raillard, M. C. and Svoboda, J.  
 Sweden: CO<sub>2</sub> emission, 264–271  
 Switzerland: Debris fan, 128–134; Glacial floodplain, 135–150; Limnology, 341–352  
 Syvitski, J. P. (Editor's Comment), iii  
 Syvitski, J. P., Jennings, A. E., and Andrews, J. T. (High-resolution Seismic Evidence for Multiple Glaciation across the Southwest Iceland Shelf), 50–57
- Taylor, K. *See* Pepin, N., et al.  
 Temperature: Alps, 242–246; Effects, 259–263; Lapse rates, 151–164, 341–352  
 Tephra analysis, 303–311  
 Tephrochronology, 71–81  
 Thermodynamic flooding model, 214–229  
 Tibet: Erosion, 436–446  
 Timberline, 242–246  
 Titus, J. H. and Tsuyuzaki, S. (Ski Slope Vegetation of Mount Hood, Oregon, U.S.A.), 283–292  
 Tockner, K. *See* Malard, F., et al.  
 Topographic models, 312–320  
 Totland, Ø. *See* Nylén, J. and Totland, Ø. and Sandvik, S. M., et al.  
 Transfer function, 353–365  
 Tree establishment, 379–388  
 Tree islands, 16–20  
 Treeline lakes, 82–93  
*Trifolium*, 400–406  
 Tsuyuzaki, S. *See* Titus, J. H. and Tsuyuzaki, S.  
 Tundra, 389–399; CO<sub>2</sub> flux, 272–277; Disturbance, 254–258; Human use, 1–15; Tussock, 254–258  
 Turney, C. S. M. (Lacustrine Bulk Organic  $\delta^{13}\text{C}$  in the British Isles during the Late Glacial-Holocene Transition [14–9 ka <sup>14</sup>C BP]), 71–81
- Ultraviolet radiation, 247–253  
 Ungulate mortality, 1–15  
 United Nations, 211–213
- Valley winds, 293–302  
 Vavrek, M. C., Fetcher, N., McGraw, J. B., Shaver, G. R., Chapin, F. S., III, and Bovard, B. (Recovery of Productivity and Species Diversity in Tussock Tundra following Disturbance), 254–258  
 Vegetation: Ski slope, 283–292  
 Voles, 278–282, 407–411  
 Vyse, E. *See* Klaus, M., et al.
- Walker, I. R. *See* Livingstone, D. M., et al.  
 Ward, J. V. *See* Malard, F., et al.  
 Water sources, 135–150  
 Welker, J. M. *See* Jones, M. H. et al.  
 Welker, J. M., Brown, K. B., and Fahnestock, J. T. (CO<sub>2</sub> Flux in Arctic and Alpine Dry Tundra: Comparative Field Responses under Ambient and Experimentally Warmed Conditions), 272–277  
 Wind regime, 293–302
- Yamada, T. *See* Chikita, K., et al.  
 Yamal Peninsula, 389–399
- Zoogeomorphology, 436–446